a result of the change of magnetic energy which occurs on application of an external magnetic field, since the magneto-caloric effect is a direct measure of this energy change. There is, however, one difficulty in interpreting these results. According to Gerlach and Schneiderhan, the resistance in the neighbourhood of the Curie point varies linearly with the field. This result seems to be in contradiction to the rest of the paper, for the magnetic energy cannot vary linearly with the field over any protracted temperature range; in fact, in the quasi-paramagnetic state above the Curie point, the energy must be proportional to the square of the field. In the neighbourhood of the Curie point, the energy may be a complicated function of the 'external' field depending upon the exact relation between the intensity of magnetisation and the field.

I have examined the change of resistance near the Curie point for fields up to 7000 gauss, as against the 400 gauss maximum of Gerlach and Schneiderhan. Just below the Curie point the resistance is found to vary almost linearly with the applied field, at the Curie point it varies more slowly than the first power of the field, and then with rising temperature the relation changes progressively to a linear relation between the resistance and the square of the applied field. This is exactly the course followed by the magneto-caloric effect and is therefore in striking agreement with Gerlach's suggestion that the resistance changes linearly with the magnetic energy. The transverse effect has also been examined, and although differing greatly from the longitudinal effect at room temperatures, it gives identical results both near and above the Curie point. This would, of course, be expected if we are concerned only with an energy change.

The results of the present work, therefore, although differing in one respect from the results of Gerlach and Schneiderhan, confirm the main suggestion made by them concerning the intimate relation between electrical resistance and magnetic energy. A more detailed account of the work will be published elsewhere.

H. H. POTTER.

H. H. Wills Physical Laboratory,
University of Bristol,
Mar. 12.

[1] *Ann. d. Phys.*, **5**, 6, p. 772.
[2] Weiss and Forrer, *Annales de Phys.*, **10**, 5, p. 153.

Effect of Internal Stress on the Magnetic Susceptibility of Metals.

IN a very interesting communication in NATURE of Dec. 27, 1930, p. 990, K. Honda and Y. Shimizu show that by high pressure the susceptibility of copper is changed * from paramagnetic to diamagnetic. The following is a simple explanation of this fact, without any special theory concerning the susceptibility of metals. We assume that the high pressure, giving a diminution of density of 0·5 per cent, so far destroys the crystal lattice of the copper that parts of the metal become amorphous; then the susceptibility after the deformation may be considered as due to the diamagnetic portion of the normal lattice together with the paramagnetic parts of the amorphous metal, the latter enclosed as a gas in the crystalline copper. It is easy to calculate that, 0·5 per cent of the metal being amorphous, the susceptibility will be changed by the amount given in the communication by Honda and Shimizu. At the temperature of re-crystallisation, the amorphous parts will disappear and the metal will regain its normal susceptibility—just as observed in the experiments quoted.

W. GERLACH.

Munich, Feb. 27.

* Change of diamagnetic susceptibility with stress was found first by H. J. Seeman and E. Vogt, *Ann. d. Phys.*, **2**, p. 980; 1929.

Scattering of X-Rays by Mercury Vapour.

IN a previous note [1] a calculation has been made of the intensity of total scattering of X-rays by monatomic gases according to a formula deduced by A. H. Compton [2] and C. V. Raman,[3] and fair agreement is obtained with the experiments of Barrett [4] on the scattering of X-rays by helium and argon gases.

By a photographic method, Scherer and Staeger [5] have recently studied the total scattering of copper $K\alpha$ radiation by mercury vapour for scattering angles ranging from 20° to 160°. It is certainly of interest to compare our theory with these results. In particular, as mentioned by Waller and Hartree,[6] there are

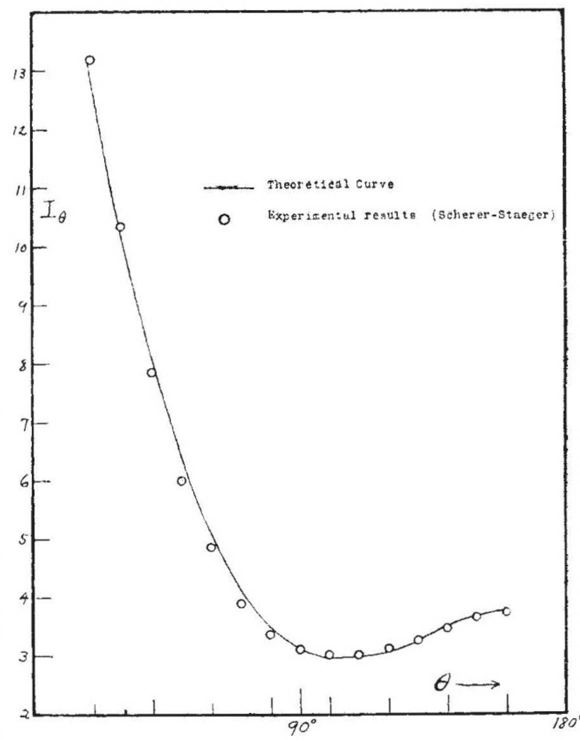

FIG. 1.

difficulties in applying the wave mechanical theory of X-ray scattering recently developed by these authors to the scattering by a heavy atom like mercury; we would like to see how our theory could account for the experiment in this case. Such a comparison is made in Fig. 1. The full curve represents the theoretical values of the scattering per atom in arbitrary units, plotted against the scattering angle θ. The encircled points are the experimental data taken from the scattering curve given by Scherer and Staeger and fitted to the theoretical curve at θ equal to 90°. It is seen that the agreement between theory and experiment is satisfactory throughout the range of the scattering angle examined.

It may be pointed out that for the scattering of copper $K\alpha$ by mercury vapour, the contribution from the incoherent scattering to the intensity of total scattering amounts to about one per cent. Thus the scattering nearly follows the well-known expression

$$I_\theta = \frac{Ie^4(1+\cos^2\theta)}{2m^2R^2C^4}F^2,$$

where F is the 'atomic structure factor' (that is, equivalent to ZF of the previous note, loc. cit.). The